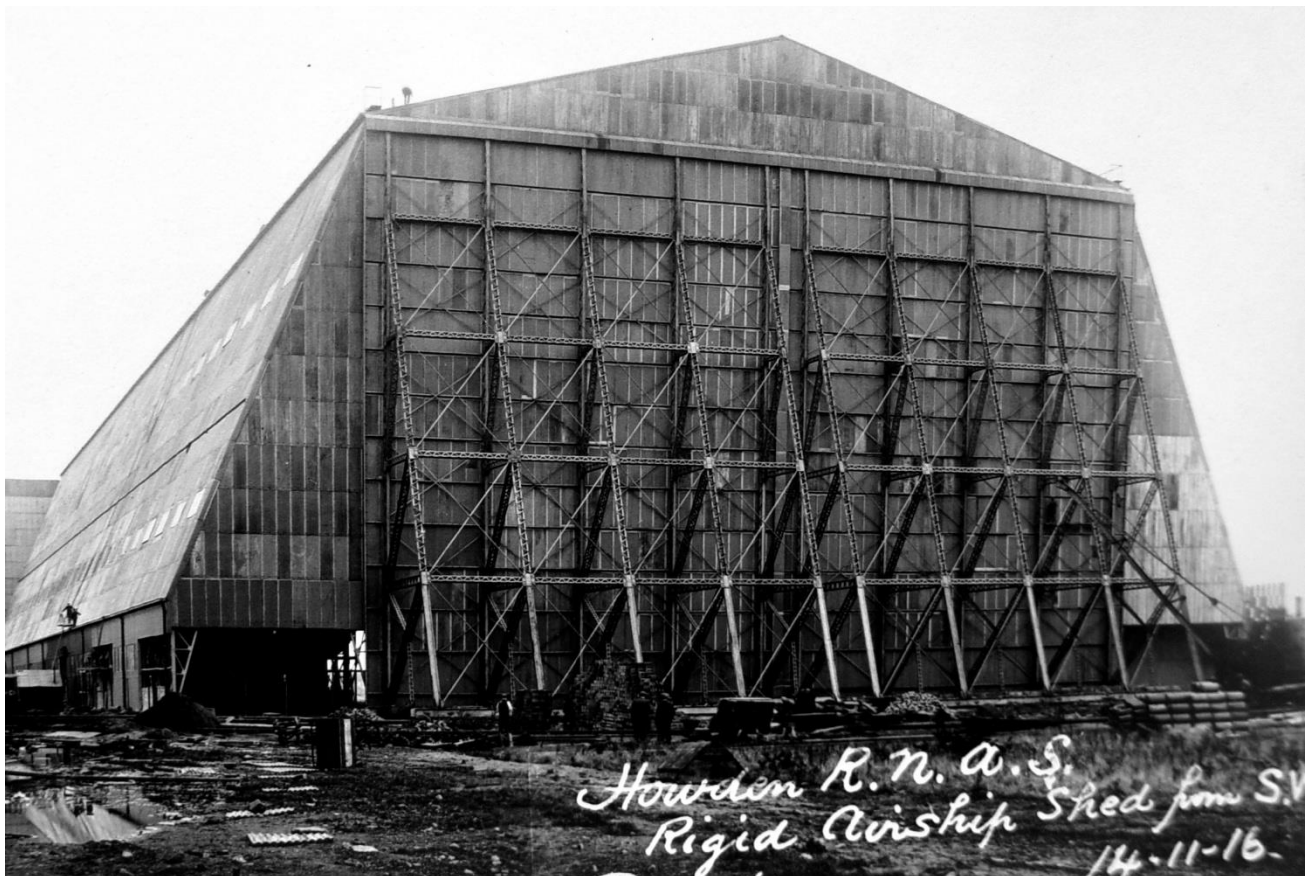


# Airfield Research Group Ltd

## ARG Research Note 19: RNAS Howden History and Assessment of Extant Structures

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## **Part 1: Methodology & Notes on Sources**

Parts 1 to 6 is a desk-based study has been commissioned by CGMS to provide baseline information in order to compile a record of the buildings and structures that were once part of the First World War Howden Airship Station. Part 7 is an assessment of what survives in 2011.

The report has taken the central part of the 1916 requisitioned land for its main study area; it includes the aerodrome and an 80 acre plot which was once occupied by the station buildings but which has since been demolished. The area that has been studied is largely covered by the Ordnance Survey grid kilometre square SE 74 32. This report is largely based on primary sources located at The National Archives (TNA), Kew, and includes a large and very important collection of contemporary photographs showing the construction of the station between 1916 and 1919. The presence of such a large collection of images from WWI showing a military air station being built is quite remarkable. Although the originals are generally quite poor in quality, as a result of bad storage (many have deteriorated over time), they have been copied and then enhanced digitally. The results are a considerable improvement on the originals and these have been transferred to a CD in support of this report.

Another photographic source is the Airfield Research Group archives which include images taken in the early 1980s, plus a few more recent ones – these have also been added to the CD.

A search was made of surviving Air Ministry records at the TNA. Relevant files at the TNA mainly consist of documents relating to the post-WWI period, with the majority of files concerned with the problems associated with the twin shed and the construction of the R100.

A key source is the HMSO publication CB 819: Royal Naval Air Service State of Development of the Airship Service, of 1 January 1918. This booklet gives an excellent description of the operational side of all airship patrol stations.

### **Copyright Statement**

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Plate 1: MT Garage 13-09-17

## Part 2: Royal Naval Air Service – An Overview

In October 1912, the Admiralty decided to establish a chain of seaplane and airship stations on the east-coast of Britain. The earliest of these, after Eastchurch, was the seaplane station on the Isle of Grain, commissioned in December 1912, with Lieutenant JW Seddon as officer in command. This was followed, in the first half of 1913, by seaplane stations at Calshot, Cromarty, Felixstowe and Yarmouth. HMS *Hermes* replaced HMS *Actaeon* on 7 May 1913, as headquarters of the Naval Wing and her commanding officer was Captain GW Vivian, RN – who was also given charge of all coastal air stations. An airship station was established at Kingsnorth, completed in April 1914, by which time all airships had been handed over to the Admiralty.

In the naval manoeuvres of July 1913, the *Hermes* was equipped with launching platforms plus two seaplanes and operated with the fleet. On 26 October 1913, the First Lord of the Admiralty (Winston Churchill), outlined his future policy for the Royal Naval Air Service (RNAS). He recommended three new types of aircraft: an overseas fighting seaplane, to operate from a ship, a scouting seaplane to work with the fleet at sea, and a home-defence fighting aeroplane, to repel enemy aircraft and to carry out patrol duties along the British coast.

The Admiralty conducted many experiments in using the aircraft as a fighting machine, including bomb-dropping trials using a Shorts pusher type carrying a dummy 100lb bomb, and in December 1912, experiments were conducted to determine the lowest height at which bombs could be released from an aeroplane. Other work included the firing of Hales grenades from rifles, and trials were carried out during October 1913 using guns and special types of ammunition against balloon fabric at the Cotton Powder Company's works at Faversham. At the outbreak of war, the only effective weapon against the Zeppelin from the air was the Hales grenade, and these were hastily distributed among the East Coast seaplane stations. The Naval Wing had also conducted experiments with the mounting of machine-guns to aircraft before the outbreak of WWI. The RNAS therefore, was more experienced in using aircraft as a fighting machine than the RFC, and accordingly, became responsible for the defence of Britain while the RFC, had the task of scouting for the British Expeditionary Force (BEF).

At the end of 1913, HMS *Hermes* was paid off, and the headquarters of the Naval Wing transferred to the Central Air Office, Sheerness with Captain Scarlett, RN (2<sup>nd</sup> in command on *Hermes*), placed in charge with the title of Inspecting Captain of Aircraft. At the request of the Secretary of War (Lord Kitchener), the First Lord of the Admiralty was invited in September 1914, to become responsible for home defence against enemy aircraft.

At the beginning of the war, the RNAS had only two aircraft fitted with machine-guns, and one airship (No. 3 Airship, the *Astra-Torres*), fitted with a Hotchkiss gun. All other aircraft were equipped with rifles. The Isle of Grain had four Hales grenades and both Hendon (the station for the defence of London) and Felixstowe had twelve each. In contrast, Eastchurch had a 150 hand-grenades, 42 rifle grenades, 26 bombs (twenty pound), and a Maxim gun.

On 1 July 1914, the separate existence of the RNAS (with its own constitution) was officially recognised, with administration coming under the Air Department of the Admiralty and the Central Air Office. The first real opportunity to demonstrate its use in connection with naval operations, came during the review of the fleet by the King, at Spithead, from 18 to 22 July 1914. On 20 July an organised flight of seventeen seaplanes, and two flights of aeroplanes in formation headed by Commander Samson, flew over the fleet. Three airships from Farnborough and Kingsnorth also took part.

On 29 July, instructions were issued, that the duties of scouting and patrol were to be secondary to the protection of the country against hostile aircraft – all aeroplanes were to be kept at readiness. It was not until 21 December 1914, that the first air-raid took place on Britain, when a single aircraft dropped bombs close to the Admiralty Pier at Dover, and on the night of 19 / 20



January, the first airship raid on Britain took place. On 24 August 1914, the Government approved the formation of two RNAS squadrons, one to be based at Fort Grange.

On the outbreak of war, the role of the RNAS was to support the BEF during its passage across the Channel, and regular patrols were flown between Westgate and Ostend. The earliest measure of defence for the UK, ordered by the Admiralty, was the institution of a coastal patrol of the East Coast, from Kinnaird's Head in Aberdeenshire, to Dungeness in Kent. Incomplete RFC squadrons undertook the northern and southern extremes, while the RNAS patrolled the most vulnerable part. This arrangement was altered slightly after the Germans had established themselves in Belgium, as it was believed that they would use Belgium to attack the vulnerable points along the Thames Estuary. For home defence the RNAS was therefore, concentrated in a line between the Humber and the Thames. For anti-submarine patrol duties, there were three main types of operational RNAS stations:

- Marine Operations (Aeroplane) Station – aerodrome for landplanes
- Marine Operations (Seaplane) Station – seaplane station for seaplanes
- Marine Operations (Balloon) Stations – aerodrome for balloons used in conjunction with Naval craft on convoy or patrol duties
- Airship Patrol Station – either dedicated to rigid or non-rigid airships.

In May 1915, the first RNAS kite balloon sections were despatched to France. During January 1915, Wing Commander Maitland, RNAS, had inspected a Belgian kite balloon (probably of the French Caquot type after the inventor Albert Caquot [1881-1976]), which had been flying at a time when British balloons were grounded due to the poor weather. He therefore came to the conclusion that captive spherical balloons were handicapped by the weather and recommended the formation of kite balloon sections using sausage-like streamlined captive balloons. The first British wartime dirigible became known as the SS type or, *Submarine Scout*. This particular balloon consisted of a modified BE2c fuselage fitted with a 70hp Renault engine suspended beneath a simple envelope of rubberised fabric. They were designed for searching narrow channels such as the Dover Straits or Irish Narrows.

On 1 August 1915 the Admiralty Air Department reorganised the RNAS. The air stations were now grouped together for operations under the senior naval officer of the nearest naval base – for example, the Marine Operations (Aeroplane) Station at Sea Houses, Northumberland came under the senior Naval Officer, Tyne for operations.

This had the immediate effect of having a closer liaison between air and surface craft. Admiral Bacon, for example, became responsible for the aeroplane and seaplane bases at Dover and Dunkirk, together with the Submarine Scout (SS) airship stations at Capel and Polegate. To advise him on air matters, Wing Commander CL Lambe was appointed to the Admiral's staff.

An airship patrol of the Channel was established from 10 August 1915 and undertaken by airships Nos. 3 and 4 – a typical patrol lasted twelve hours, while an average time for a seaplane was just three hours.

The assembly and testing of a new and larger type of non-rigid airship began in September 1915, known as the Coastal Class. This was essentially an Astra-Torres envelope with a car made from two Avro fuselages joined together with their tails removed. They could cruise at 45 mph and had an eleven hour endurance. In January 1916, the first Coastal Class airship station was commissioned at Pembroke, manned by personnel from the airship station at Marquise. On 15 March Howden and Longside opened and also in March, the first airship shed at Cranwell had been completed. Eventually all free balloons were transferred from Wormwood Scrubs when Cranwell took over the training of airship officers and men from Kingsnorth.

The first coastal-type ship for Howden was delayed until 26 June 1916 – Coastal C11 being the first airship to arrive at Howden (from Kingsnorth) on 26 June 1916.



Plate 2: Howden Site Plan 1918

## Part 3: Location and Planning

Howden, in East Yorkshire functioned as an RNAS operational patrol station for non-rigid and rigid airships<sup>1</sup>. It was also a parent to two sub-stations or mooring stations, located at Lowthorpe and Kirkleatham.

The parent site is located to the north of Howden village mainly on the east side of Bubwith Road, but the requisitioned land appears to have included as far west as Brindley's Plantation, and as far south to include part of Spaldington Common, then Hall Farm in the east and Mount Pleasant Farm to the north. Brindcommon Farm, located in the southern corner of the site, was at first used by the works department but was then demolished.

The site was planned from the beginning, based around a standard RNAS patrol station arrangement with the main sheds being built in two phases. Firstly around October 1915, two coastal class sheds were erected by the Cleveland Bridge and Engineering Co. of Darlington. This was followed by a larger rigid class shed by Frindlay and Co Ltd of Motherwell, being completed in December 1916.

The usual design practice for airship stations was enforced by aligning the sheds with their length in the direction of the prevailing wind, so that the majority of wind normally encountered was more or less up and down the shed – a dead cross-wind was only encountered on rare occasions.

In addition to the patrol station arrangement, another much larger twin shed was also constructed by Cleveland Bridge and Engineering Co Ltd. The erection of this building commenced in August 1917 and was completed around 31 March 1919.

The planning of the original station consisted of the two coastal sheds positioned in front of the first rigid shed on the NE end so that they could act as wind breaks, and projecting out from either coastal shed was a 700 feet long wind shield or break constructed of steel framing. This arrangement offered protection to the ship as it left or entered its shed during a cross-wind.

The other buildings were standard single-storey designs, similar to others erected at various airship patrol stations in the UK, such as East Fortune and Moreton. Buildings were generally arranged within three main groups, beginning with a domestic series of structures to the south-west.

The main 18 feet wide RNAS service road (aligned SW / NE) was constructed off the Howden–Bubwith road, and buildings were erected to the north of it while the airship sheds were to the south (a section was lit by electric lighting, the fittings fixed to lamp standards). Buildings or groups of structures were served by a nine feet wide road network with passing places, off the main one. The site was also served by a siding off the North Eastern Railway line from Selby to Hull which left the main line at North Howden Junction and ran north-west to enter the site north of Howden Station – a distance of 1.5 miles. This crossed the Bubwith Road at the Spaldington road junction; the line crossed the aerodrome towards the technical buildings and airship sheds. About mid-way across there were three reception sidings (the largest for twelve wagons) with spurs to the two rigid sheds and the main one terminated at the coal store.

The aerodrome had maximum dimensions of 3,100 by 2,600 yards and the whole site covered an area of 1,240 acres of which 80 acres was occupied by station buildings. The aerodrome occupied the land to the south, east and west of the airship sheds, some existing drains and ditches were piped and filled in and a cinder nine feet wide perimeter track was built from the eastern end of the RNAS road in the north. Its route went south to connect with the Spaldington

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<sup>1</sup> The term 'rigid' is applied to those airships which have a hull framework of built-up timber or aluminium alloy, covered with a flexible envelope. Non-rigid types have no such hull framework, and retain their shape only as long as the pressure within the flexible envelope is maintained greater than ambient atmospheric pressure.

Road. Ten mooring block sites were built around this perimeter, of which one was located on the south side of Spaldington Road, and another to the east of the Howden–Bubwith Road.

On the southern side of Spaldington Road, just east of Spaldington Grange, was the site of the wireless station.

The station complement at the beginning of 1918 was 40 officers and 612 men and for operational purposes the station was located in North East Area; No.18 (Operations) Group.

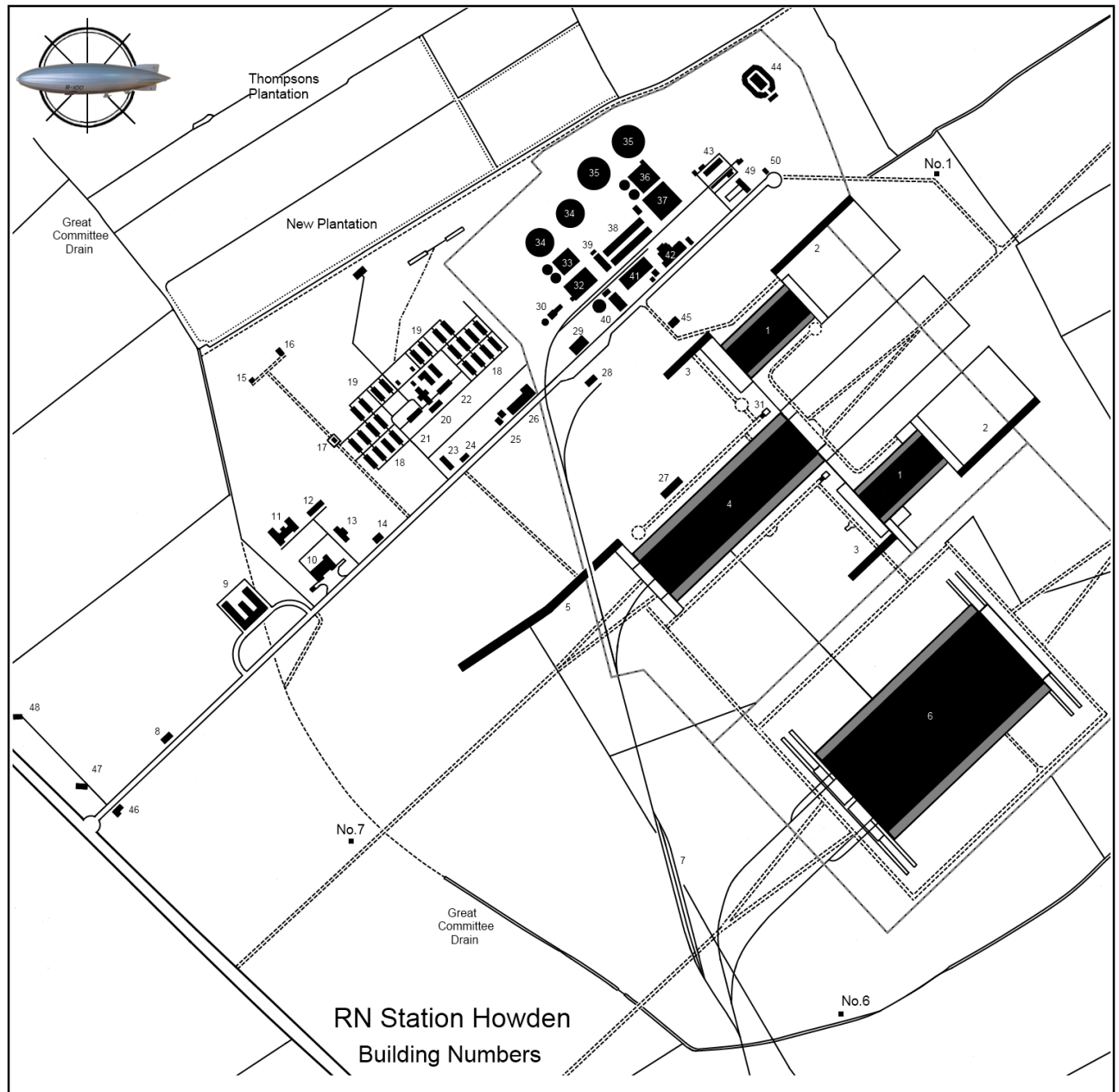


Plate 3: Map showing building numbers (un-official)

### Key to Plate 3

1	Airship Shed 320 ft by 110 ft by 80 ft	2	Windbreak
3	Windbreak 200 ft by 50 ft	4	Airship Shed 700 ft by 150 ft by 100 ft
5	Windbreak 700 ft by 70 ft	6	Twin Airship Shed
7	Railway Siding	8	Compressor House (drainage)
9	Officers' Quarters	10	MT Garage
11	Servants' Quarters	12	Warrant Officers' Quarters
13	Station Offices	14	First Aid Room
15	Detonator Store	16	Small Arms Ammunition Store
17	Latrine Block	18	Men's Barracks
19	CPO & PO's Quarters	20	CPO & PO's Mess
21	Men's Mess	22	Unknown
23	Works Dept Office	24	Cookhouse
25	Church & Post Office	26	YMCA Hut
27	Smith's Shop	28	Petrol Installation
29	Lecture Room	30	Water Tower
31	Latrine Block	32	Compressor House
33	Water Gas Hydrogen Plant	34	Gas Holders 250,000 cu ft
35	Gas Holders 500,000 cu ft	36	Water Gas Hydrogen Plant
37	Water Gas Hydrogen Plant	38	Gas Bottle Storage Foundation Blocks
39	Compressor House	40	Silicol Plant & gasholder 20,000 cu ft
41	Unknown	42	Electric Light & Power Station
43	DW Compound & Stores (carpenters, general store, cement store & latrines)	44	Magazine
45	Temporary Silicol Plant	46	Telephone Exchange
47	Pigeon Loft	48	Meteorological Office
49	Station Store	50	Old Wireless Station



Plate 4: Brindcommon Farm 23-03-17





Plate 5: Wireless station looking south 09-08-17



Plate 6: Pigeon Loft 17-04-17

## Part 4: The Airship Sheds

### 4.1 Coastal Sheds

The two coastal sheds were constructed by the Cleveland Bridge & Engineering Co Ltd, beginning around September 1915, and preceded the rigid airship shed. They were 11 bays long with full length annexes (22 feet wide) along both longitudinal walls. The main doors, in two leaves, were located at either end. The sheds were separated by a distance of 520 feet, and No.1 rigid airship shed was erected in a central position to the south-west of them with its north-east doors aligned with the south-west ends of the coastal sheds. The gaps between the rigid and the coastal sheds were occupied by 80 feet high screens. The windscreen of the north coastal shed was extended and as an experiment it was covered with expanded metal instead of corrugated iron. The tests carried out proved satisfactory as no suction was caused and eddies were reduced. In addition the bottoms of all windscreens were filled in with brushwood which also gave good results. The main screens were 380 feet long by 70 feet wide on the north-east side and 200 feet by 50 feet on the south-west side.

- Coastal airship shed No.1 was 323 ft 1 in long by 110 ft 8 in wide and a clear height of 80 ft 2 in.
- Coastal airship shed No.2 was 320 ft long by 110 ft and a clear height of 80 ft.

Note: another source gives both sheds at 320 ft by 110 ft by 80 ft

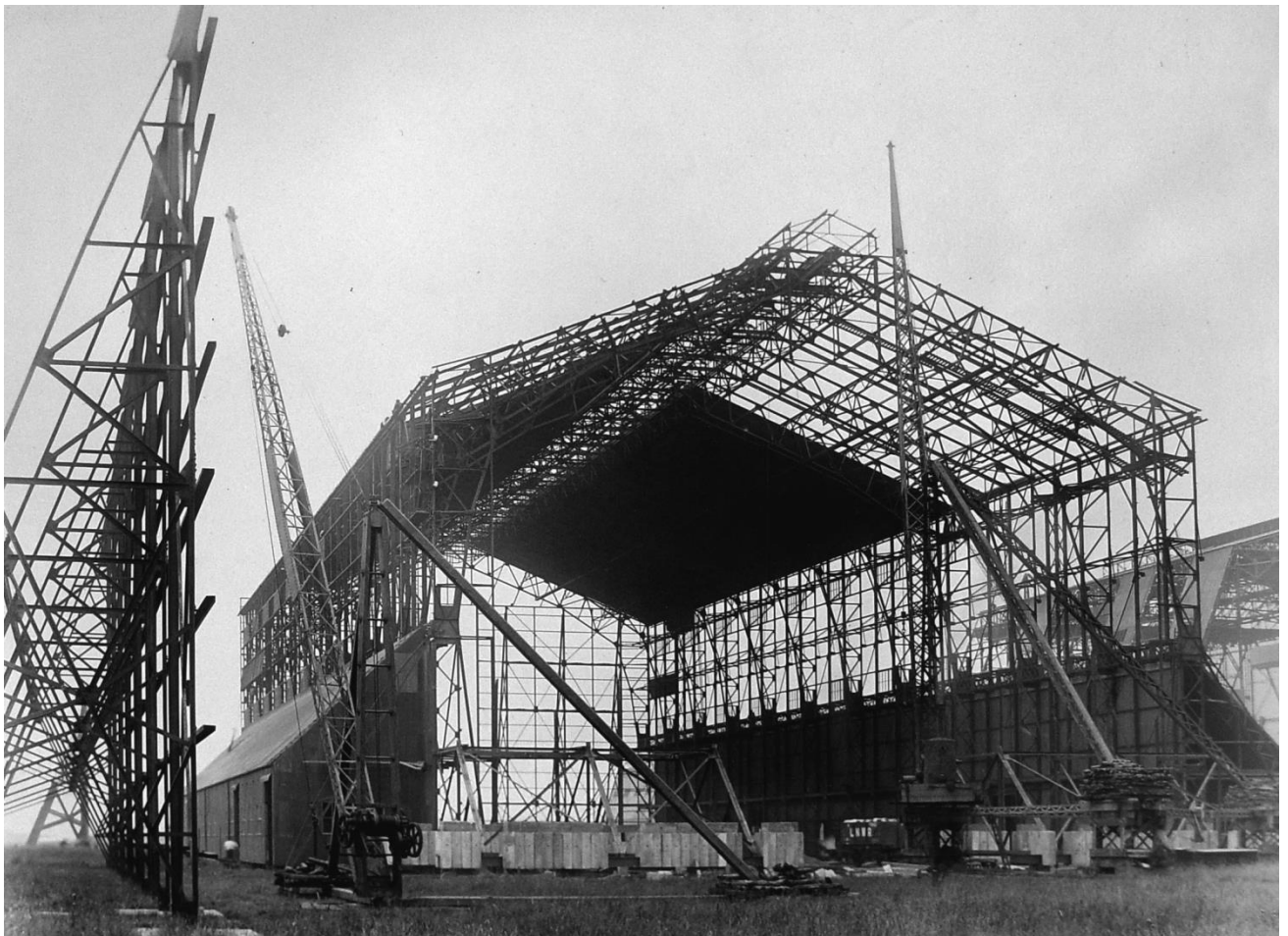


Plate 7: Coastal shed and windbreak under construction 27-07-16



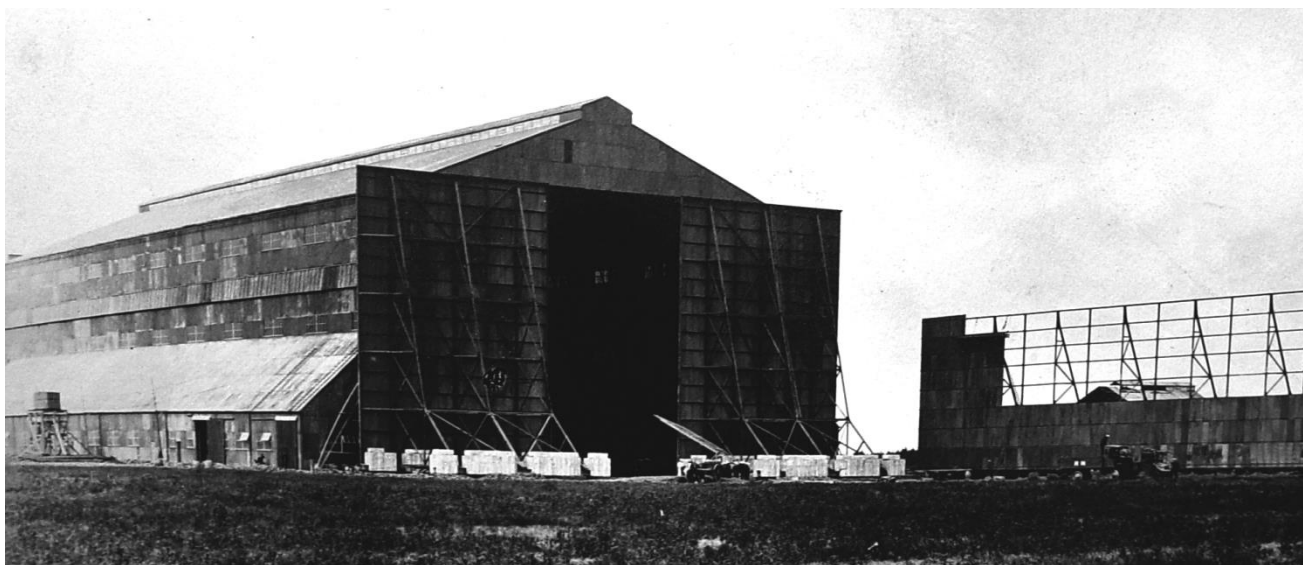


Plate 8: Coastal shed with wind break under construction.



Plate 9: Coastal shed with wind break and petrol installation  
under construction 25-05-17

## 4.2 Shed No.1

A Findlay & Co. Ltd was awarded a contract in 1916 to design and build the No.1 shed at Howden. The two sheds to house non-rigid coastal class airships had already been completed when construction started. The new shed had a 150ft clear span, 100ft clear height and a length of 700ft. Roof girders were spaced at 25ft centres which were carried on 98ft high braced 'A'-frame trestles forming 28-bays. For stability wall trestles were joined by six longitudinal girders. Internal annexes were accommodated within the 'A'-frame trestles, these being 35ft wide and ran the whole length of the shed. Howden No.1 was completed in December 1916. The shed had been erected by two steam derrick cranes placed on staging made out of the permanent doors, and the roof girders were then lifted in one piece.

It was constructed for a new class of rigid airship known as Class 23.

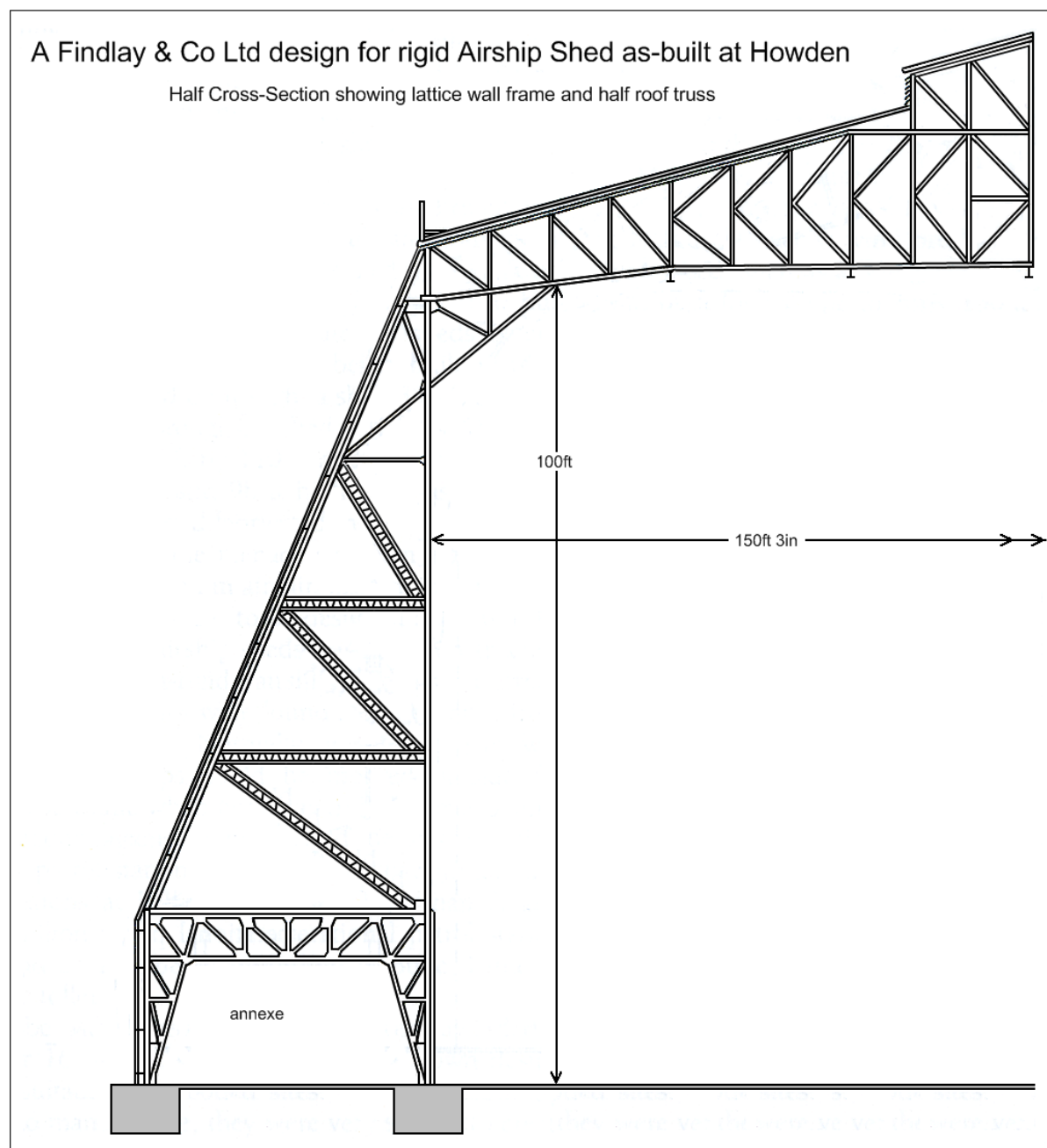


Plate 10: Half cross-section of Rigid Shed



Plate 11: Rigid Shed No.1 29-09-16

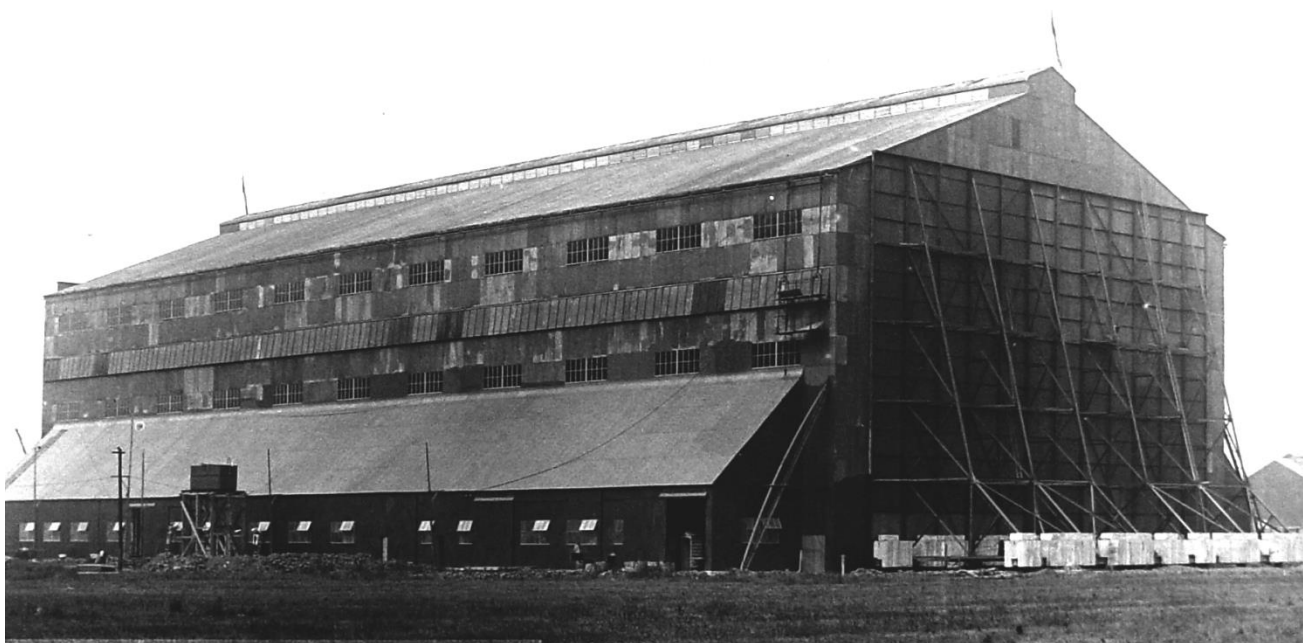


Plate 12: Rigid Shed No.1

## **4.3 Shed No.2**

### **4.3.1 Description**

The twin shed at Howden (No.2 shed), was erected between November 1917 and 1 April 1919 to house two of the latest type of rigid airships. Designed and constructed by Sir William Arrol & Co. Ltd – not only was it the largest airship shed ever built in Britain, covering 8.5 acres (including doors) – it was also the largest building in the UK. Two spans were erected, each of 150 feet by 130 feet high and a length of 750 feet – the total weight being 5,208 tons. It was constructed mainly of steel with some parts in timber and brick.

There were therefore two spans arranged side-by-side (coupled or twin shed), supported on the inside by a shared row of central columns and on the opposite ends by frames running down both sides. The outer frames also formed full-length annexe workshops, each 35 feet wide. The clear height at the centre of the main spans was 140 feet and to the ridge of the roof, a total of about 160 feet. Sliding doors were provided at both ends, consisting of four leaves, each 150 feet by 130 feet. These were independent of the shed and were of the semi-ballasted type, running on parallel tracks which were 48 feet apart.

The main spans of the shed were three-pin arches, the springing pin on the outer side (3 inches in diameter), rested at a height of 60 feet from the floor (at the highest point of the annexe roof), and this was fixed to a lattice framework which formed the inner part of the annexe. The main ribs were spaced at 30 feet centres arranged as 25 bays and these carried side and roof girders.

The annexe framework was also of rigid construction, there was a concrete ceiling at 17 feet height and this ground floor section was separated from the main shed by brickwork; the outer walls were also brick. One annexe had internal brick walls which provided stores, workshops and offices, but the other annexe may have been left undivided. Annexe foundations were reinforced concrete blocks with four 1.625 inch anchor bolts set at an angle of 45 degrees to resist uplift under wind pressure.

The centre columns above annexe height were 12 feet wide but these spread out to 30 feet at ground floor level. They were spaced at 30 feet centres and were rigidly braced by two rows of box girders. The foundations were reinforced with both legs being anchored down by with four 1.25 inch bolts.

A concrete floor was provided with a minimum thickness of four inches, it covered the entire area of the shed including annexes (about 34,300 square yards), which was laid over a bed of hardcore also of four inches thick. Longitudinal and cross trenches were inserted into the floor as required to carry hydrogen mains, heating pipes and for drainage etc. Mooring blocks were also provided at intervals in the floor for anchoring airships, and a railway track of 4 ft 8.5 inch gauge was laid into each half of the shed (see below).

Ventilation was in the form of a continuous framework which ran full length and consisted of a series of fixed louvres each side.

The sides and roof were clad with 20-gauge corrugated galvanised sheeting. and explosion flaps were fitted high up on each side; these were hinged at the bottom and loosely held in place at the top and covered in corrugated sheeting.

Seven emergency panic doors were provided on the ground floor, and runway beams and gangways were provided at high level.

The main roof drained into three pressed-steel gutters and these discharged directly into sixteen storage tanks, each of 5,300 gallons capacity. These were located close to the eaves and valley gutters. An observation cabin (10 ft by 6 ft) was erected on the ridge at one end of the shed, with access from the central gangway below, and an outside fire-escape.

The site for the twin shed was found to be practically level and consists of roughly 12 inches of soil, overlying six feet of clay, which is bedded on sand and warp. It was therefore decided to rest the shed on the crust of clay, and in order to avoid the possibility of penetrating it, the maximum depth of foundations was fixed at three feet below ground level, the floor level being six inches above the ground line.

The wind load on the side of the shed was 30 lb per square foot, which gave a total pressure of roughly 60 tons per panel, or 1,500 tons over the full length of the shed. The reaction on the bases were therefore quite considerable, and as the concrete was limited to just 3 feet 6 inches in thickness, with a ground pressure of 15 cwt per square foot, it was necessary to reinforce all main blocks. The sizes of these blocks were as follows:

Annexe outer block	9 ft 6 in by 9 ft 6 ins by 3 ft 6 in
Annexe column	15 ft 6 in by 13 ft by 3 ft 6 in
Centre columns (each leg)	15 ft by 12 ft 6 in by 3 ft 6 in

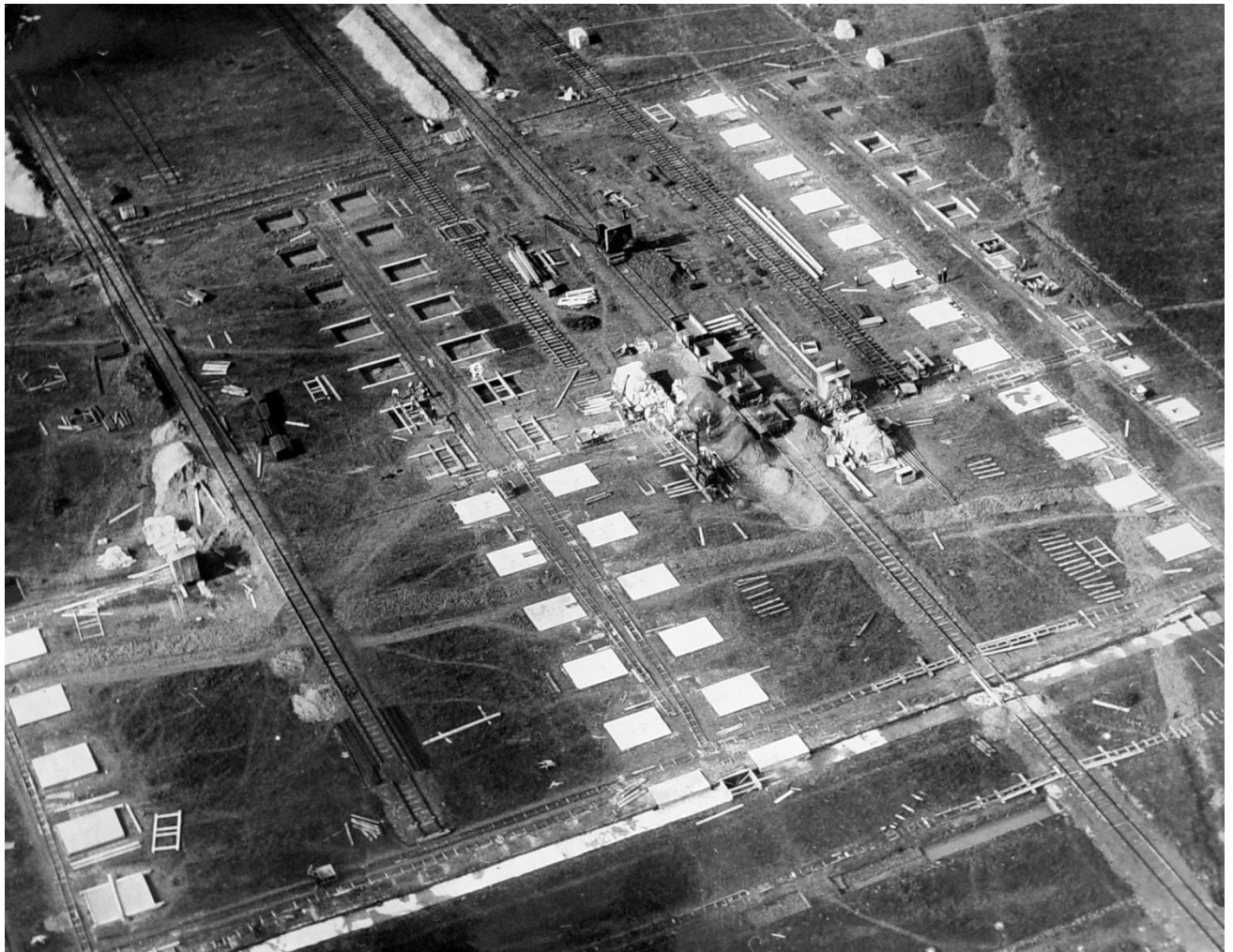


Plate 13: Aerial view showing the twin shed foundation blocks being constructed  
August 1917



#### 4.3.2 Staging

For the erection of this high structure it was found necessary to provide two temporary steel stages, each 96 feet wide, 106 feet long and 100 feet high, each carrying two 5-ton 110-foot jib steam derrick cranes. These special stages were used instead of using the main doors as stages as used in the No.1 shed. The stages and cranes allowed perfect command of the erection, with the whole of the shed and main door steelwork being erected by them. Each one was erected onto steel bogies which travelled on the two railway tracks. As the erection proceeded the stage was drawn back by means of a locomotive crane and wire rope tackles. The railway tracks had to be kept well ballasted, level and parallel. Near the top on the outer face of each stage a moveable arm was fitted, for use in securing the first length of main rib after connection to the bottom pin, and for holding it in position until the top length of the main rib was erected and connected to the centre.

A platform 25 feet by 96 feet, constructed of three-inch timbers and carried by steel girders on top of the staging was built some 26 feet higher than the base of the cranes and some 126 feet from the ground. This provided a safe working platform for the men erecting the main arch. Electric lights had to be fitted to the tops of the outer 110-foot jibs for protection against night flying, as the end of the jib was about 200 feet above ground level.

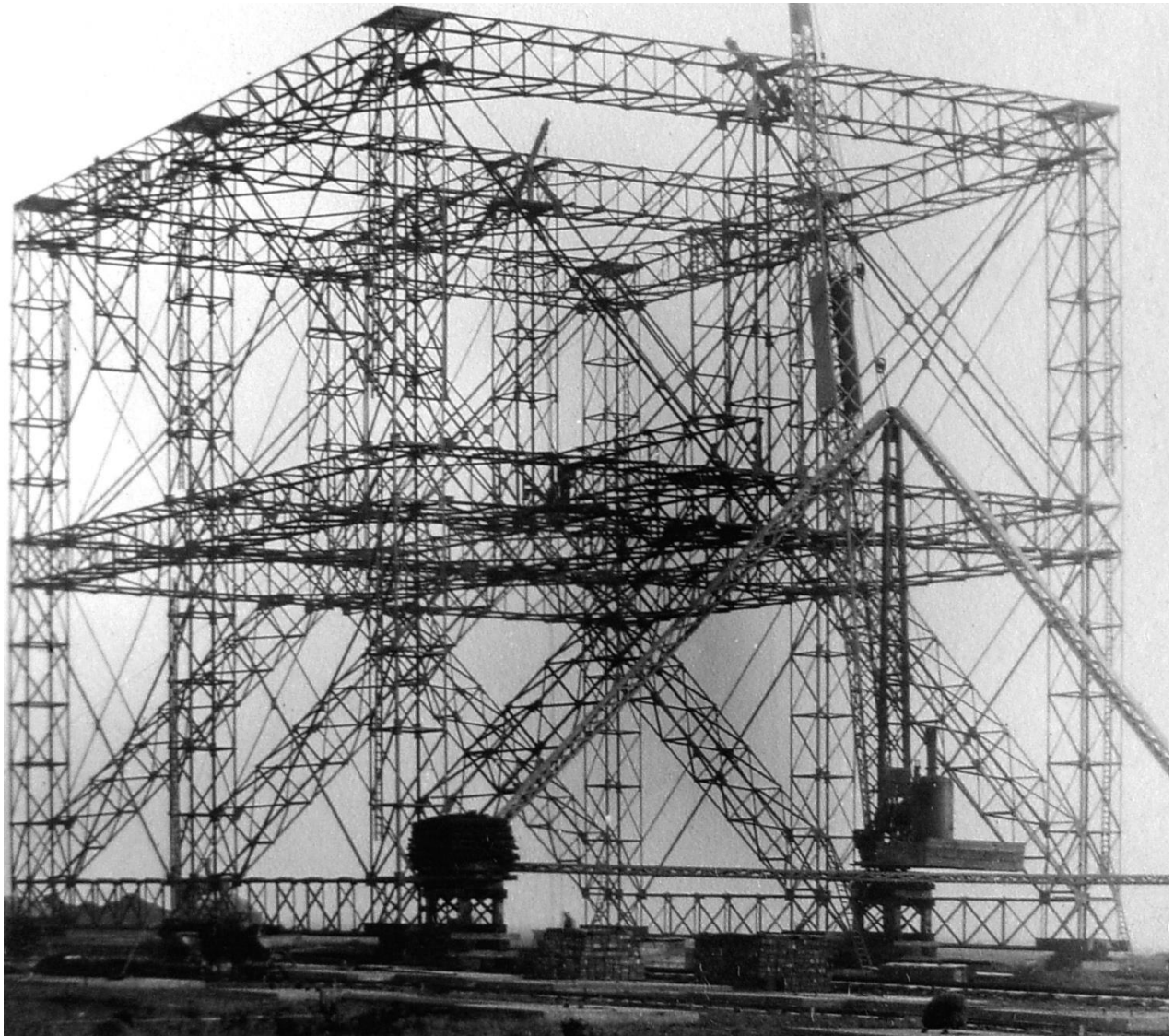


Plate 14: Travelling stage being erected 11-12-17

### 4.3.3 Shed Erection

Following the construction of the staging, came erecting of the steelwork of the shed, and a start was made at the west end. The north and south annexes frameworks were erected first up to the level of the first longitudinal box girder, a height of about 60 feet. The main columns of the annexes were carefully plumbed and levelled, and bolted to the rakers and box girder ready for the supporting arch.

After the erection of the annexes and door rails, the east main doors were constructed. The two outer doors were built first and moved out, and then the two inner doors were built immediately afterwards. The two outer cranes were used on the stages for this erection, and the two inner cranes made a start on raising the centre columns.

The door carriages and wheels were first placed in position on the rails and chocked up ready for receiving the bottom door framework. Once this had been completed the remaining steelwork was erected, the outer door first, then the inner door.

The centre columns in suitable pieces were lifted by the two inner cranes on the stages, and bolted together up to and including the main box girder at a height of 96 feet. These columns were now ready to receive the main arch. The north and south annexes and centre columns were also ready to receive the pair of spans of the main arches. The bottom pin connection rested on the box girder of the annexe main column, and the vertical length of the main arch was erected over the first two annexe members from the east end.

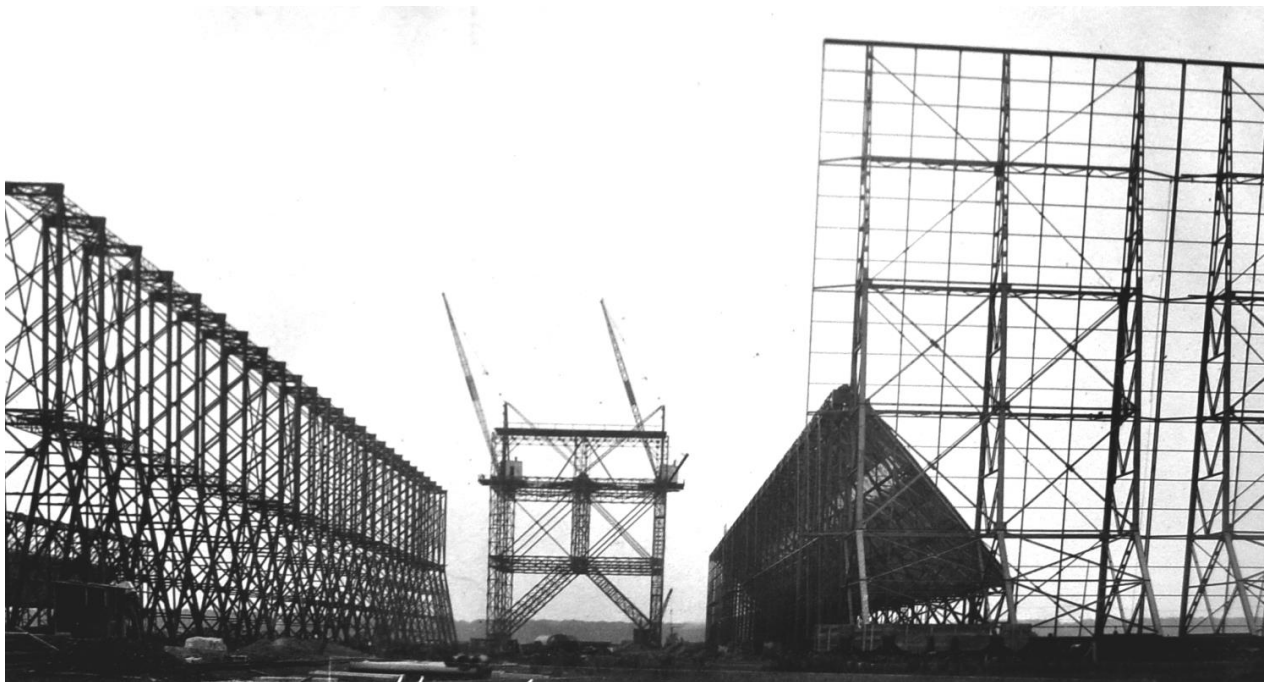


Plate 15: View from SW showing the right-hand shed annexe  
Central columns finished up to main box girder height, travelling stage and door framework 23-07-18

Both members were securely fixed temporarily by guys, so that the bracings could be fitted in the first bay, which were plumbed up and made to receive the remaining members of the main arch, erection going forward on the north and south arches, and the two spans being raised simultaneously as far as possible. The vertical members of the main arch, which connect to the pins resting on the box girder of the centre column were then elevated. The north and south pieces were temporarily bolted together on the ground and lifted in one piece, carrying the pins and brackets with them.



The last two members of the main arch were then lifted, one by each crane, one slightly ahead of the other; the two were then lowered into position, connected up at the eaves, and the centre pin driven home. The first main arch was thus now completed and the second main arch was then erected and all wind girders and intermediate trusses, along with braces were inserted to complete the bay.

A fine day was chosen for the elevation of the first bay and the stage was placed in such a position as to allow both main arch ribs to be raised without moving the stages. The stages were then moved backwards into position for the next bay, this process being repeated as the process proceeded.

After the completion of the last bay the west end main doors were erected in a similar manner to those at the east end.

#### 4.3.4 Stage Removal

A three-ton hand crane was installed on each stage for taking down the steam derrick cranes, and after removal of the cranes from the stages, a 110-foot jib crane was erected at ground level on bogies running on railway track, for the taking down of the staging steelwork.

#### 4.3.5 Sundry Work

On completion of the steelwork, came the sheeting, glazing, painting and sundry work. The shed floor had been covered with hardcore, and this helped in keeping the site dry. The concreting of the floor and the construction of the hydrogen and heating trenches then followed, after the completion of the roof covering. The floor was concreted in-situ, using nine-foot square slabs.



Plate 16: Twin Shed under construction 14-05-18

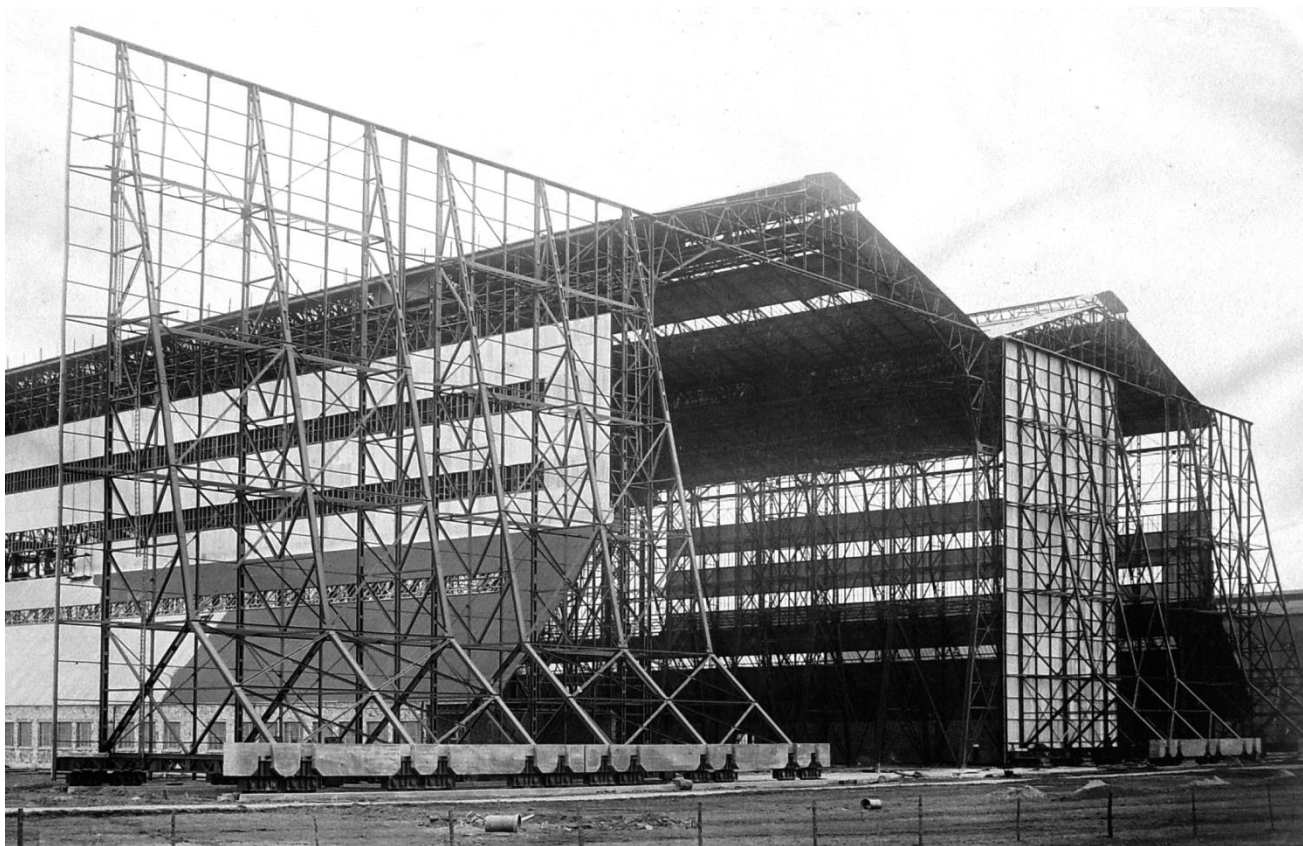


Plate 17: Twin shed with door framework 04-03-19

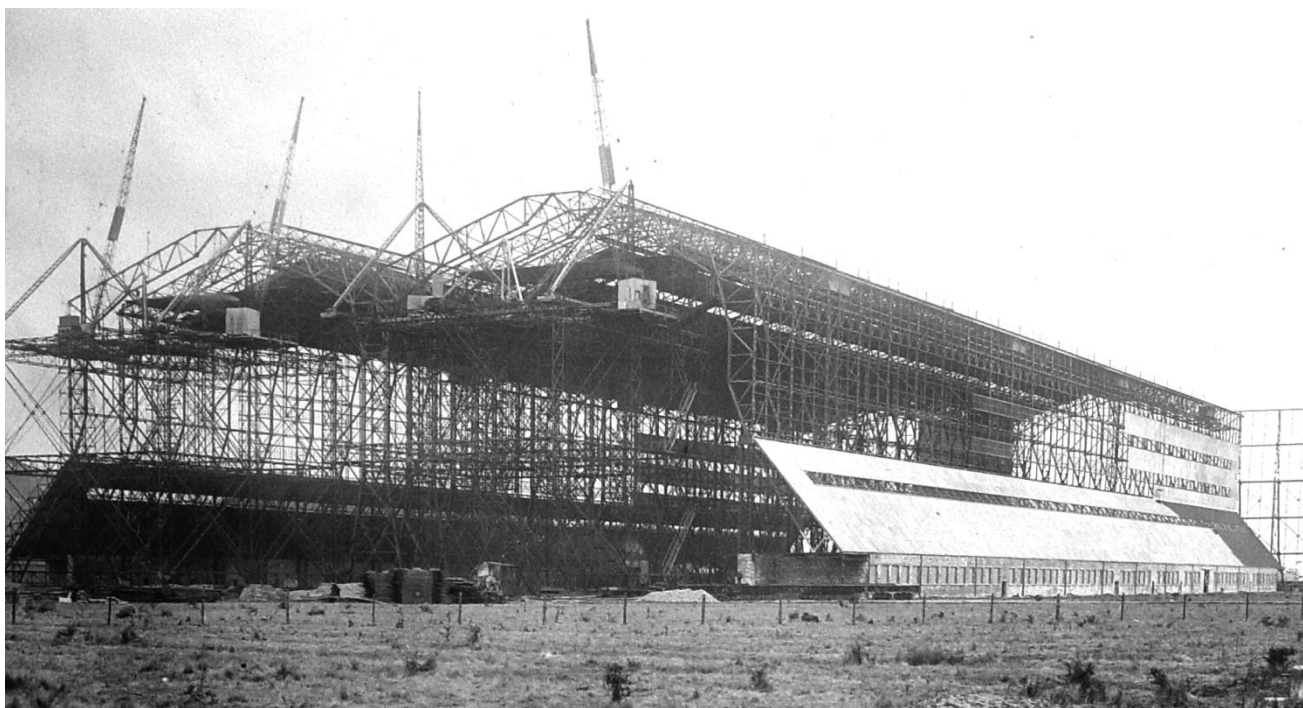


Plate 18: Twin shed 04-03-19

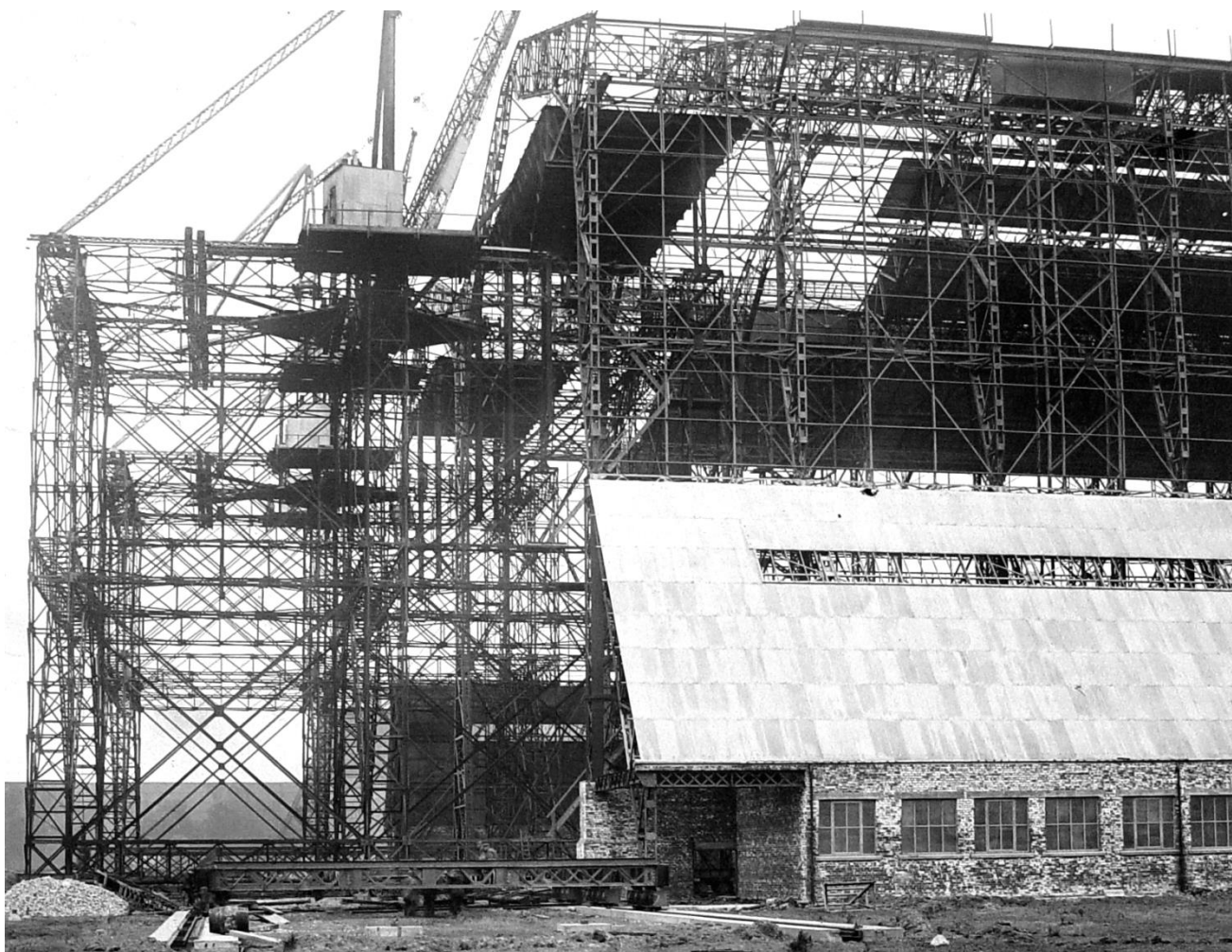


Plate 19: Twin shed 04-03-19



Plate 20: Twin shed c.1920

## Part 5: Other Buildings

### 5.1 Domestic Group

At the south-west end of the RNAS road where it joined the public one, the first building to the south of this road was a telephone exchange and barrack master's office. On the north side was the pigeon loft and further north again towards New Plantation was the meteorological office.

Going east along the RNAS road, the next building complex was the officers' quarters – a timber-framed building with its own driveway, (the centre of this structure was located 900 feet from the main entrance). This was followed by the steel-framed motor transport garage, MT petrol and oil stores, plus servants and WOs quarters (brick-built) as well as the depot or administration offices and the Air Inspection Directorate (AID) offices.

The next group of structures consisted of the main domestic accommodation and this was located 200 feet north of the RNAS road. Adjacent to the RNAS road was the works department offices and a small cook house, and on the north side was a parade ground followed by the main domestic group.

Men's accommodation consisted of two groups of eight barrack huts (wooden Armstrong huts). These were separated by a small group of mess buildings which included a central kitchen block flanked on three sides by mess blocks. The CPOs / POs quarters were located to the north of the central mess complex. Isolated in the extreme north, located between the northern section of Great Committee Drain and New Plantation was a detonator store and small arms ammunition store.

Further east along the RNAS road was the post office, YMCA hut and church. Further east along the RNAS road was the technical area.



Plate 21: Servant's quarters



Plate 22: Men's quarters



Plate 23: Officers' quarters



## **5.2 Technical Group**

At the NE end of the main RNAS road was the technical group of buildings and structures, these were all located on the northern side of the RNAS road. These were a mixture of brick and steel-framed structures, principally single-storey but with some at two-storey such as the electric light and power station.

Between the RNAS road and the railway with its small siding, was a lecture room followed by a 20,000 cu feet gasholder, silicol plant and water tower. Compressor plant for filling bottles and gas holders were three, 600 lbs for filling the holders. One 1,600 lbs and two 1,800 lbs cu feet capacity compressors were used for filling British Mannesmann Tube Co gas bottles. There were the original two 250,000 cu feet gas holders plus the later two 500,000 cu feet gas holders. After the gas plant, further east was the electric light and power station plus a boiler house.

The gas plant area was located to the north of the railway and consisted of (when fully developed) a pair of water-gas iron contact plants which could be worked separately, giving a total capacity of one million cubic feet per week for each plant unit. There were four small gasholders, a compressor house for gas filling, four 250,000 cu feet capacity gas holders and two long and parallel foundation blocks for storing gas cylinders. Construction of the first water-gas plant was completed in May 1917 and the second was completed in November 1918.

The extreme eastern end of the RNAS road terminated with a turning circle and it was here where the Directorate of Works stores and workshops were located it was also the terminus for the railway. This area included a general store, carpenter's shop, cement store, a station store, blacksmith's shop, destructor, and the original wireless station.

Positioned further east in an isolated position, was the magazine, a brick-built building with a hipped-shaped roof that was surrounded by full-height earth mounds.



Plate 24: Post office, church and YMCA

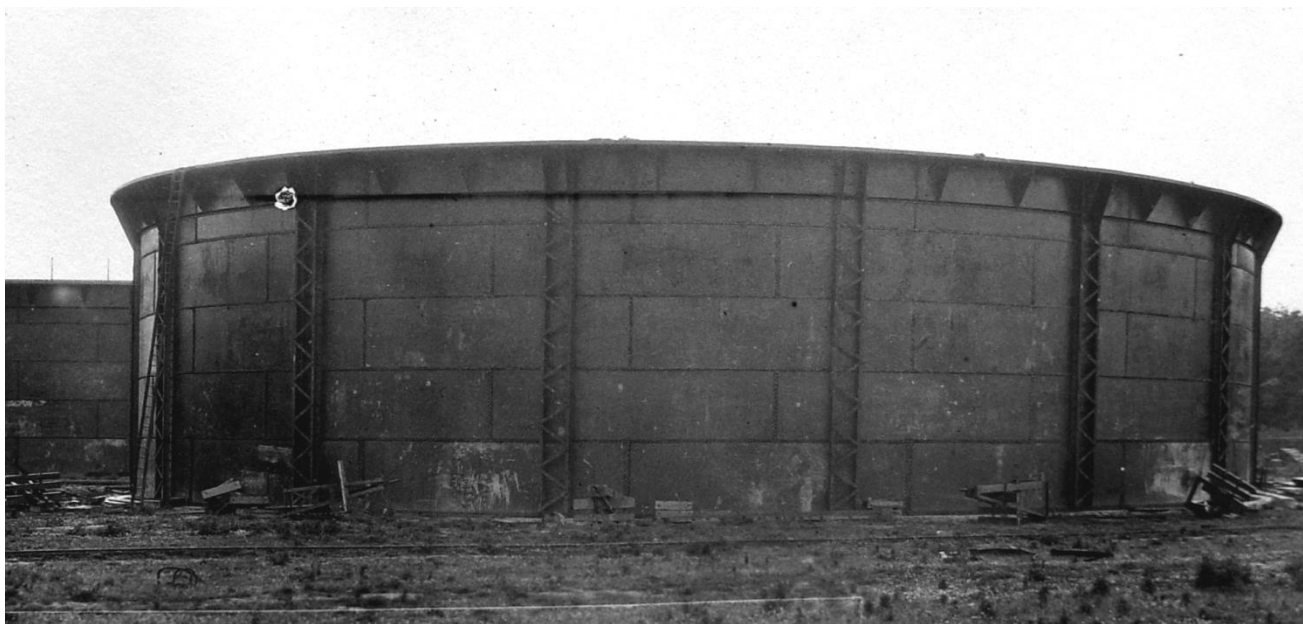


Plate 25: Gasholder 23-07-18

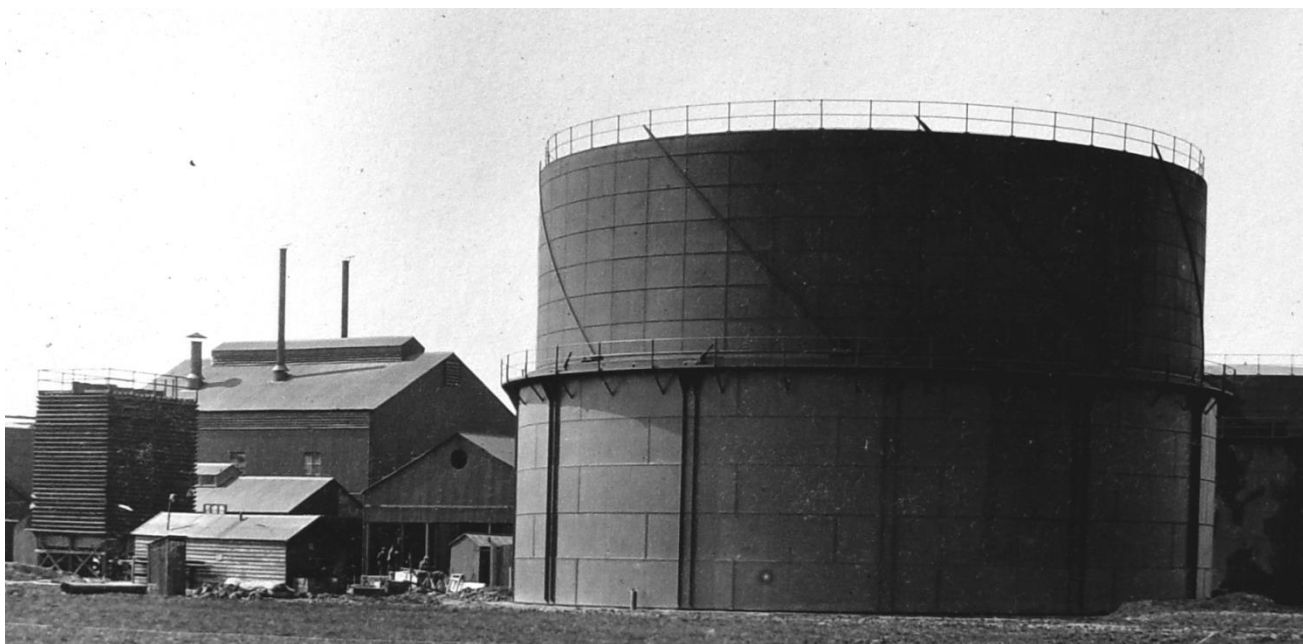


Plate 26: Gasholder (full) 23-05-17





Plate 27: Power station 27-07-16



Plate 28: Magazine



Plate 29: Hydrogen gas water plant

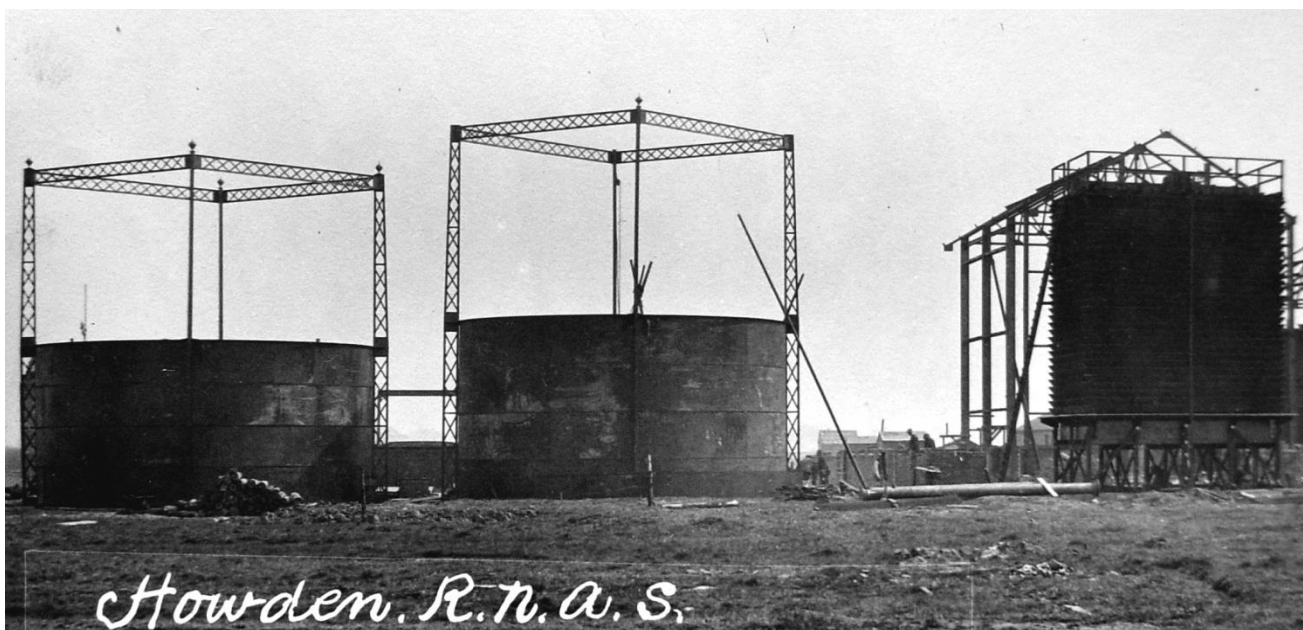


Plate 30: Hydrogen gas plant and cooling tower 15-5-18

## Part 6: Operational History

### 6.1 1916

Coastal Class airship C11 was joined by C4 and the first operational flights were carried out on 3 July. C19 arrived on strength on 26 September, followed by Parseval P4 which was transferred from Barrow and which made its first flight from Howden on 27 December. On landing she was slightly damaged but repaired by the New Year when she was used for training No.9 Rigid Trials Flight under Cmdr Masterman.

A total of 521 flying hours was completed between 26 June and 31 December 1916 by the Howden airships. Howden's complement at the end of that year was 25 officers and 476 men, including 139 men of the Air Service Constructional Corps.

Known non-rigid Coastal Patrols (airship serial number and date flown)							
CII	14-12-16	C21	14-12-16	C4	14-12-16	C4	13-11-16
CX1	13-11-16	C19	13-11-16	C19	02-10-16	C21	01-10-16
C4	30-09-16	C19	30-09-16	C21	30-09-16	C4	28-09-16
C19	21-09-16	C4	21-09-16	C4	09-09-16	CX1	08-09-16
CIV	07-09-16	CXI	07-09-16	C4	31-08-16	C11	09-08-16
C4	06-08-16	C11	05-08-16				

### 6.2 1917

The year 1917 was the first one in which all stations in commission were in a position to carry out flying throughout the whole year. Furthermore, each station had been operational for a sufficient time to be equipped with the latest development of airship. This enabled systematic schemes of co-operation between adjacent stations to be organised.

By 1 January 1917, the larger patrol stations (East Fortune, Howden, Longside, Mullion, Pembroke and Pulham) – all of which had been commissioned in the previous year – were equipped with a complement of coastal airships. They were each able to carry out such duties as required whenever weather conditions were suitable.

As a result of experience gained, it was decided in 1917 that airships could be effectively employed for the following duties:

- Co-operation with the fleet, for scouting duties
- Escort of ships or convoys
- Anti-submarine patrol and searching for mines.

With regards to the first point, the radius of action of the coastal type of non-rigid airship was not sufficient to make them useful for this purpose this was to be a function of the 33 Class of rigid airship. With regard to escort duties, airships were sent on the orders of C-in-C of various districts to escort convoys through the patrol areas of the stations. For example, the areas through which the convoys passed were swept by airships, convoys were warned of the presence of submarines, submarines were engaged and assistance was summoned for torpedoed vessels. Northbound convoys from the Humber were escorted by Howden airships to the northern-most limit of their patrol, they were then taken over by the airships of East Fortune, and in proceeding still further north were then escorted by airships from Longside. By this means merchant vessels could be escorted from Spurn Point to the extreme north coast of Scotland.

Definite patrol areas were laid down for each station and these were extended after April for the stations at East Fortune and Howden whereby they overlapped at the river Tyne. Prior to this, patrols from Howden were generally limited with one airship flying to a position 20 miles due east of Hornsea at 800 feet, then on to a position 20 miles due east of the mouth of the river Tees, and return. Another airship would be ordered to a position 20 miles due east of Hornsea at 800 feet, then to Sheringham Bank Light, and return by the same route. Anti-submarine patrols embraced the whole coast of the UK with the exception of the west coast of Scotland. Patrols were carried out in conjunction with destroyers, airships using the same radio wave length as the destroyer flotillas.

The compliment of airships based at Howden at the end of 1917 consisted of the following:

- Rigids                Nos. 9 and 25
- Parsevals        Nos. 5 and 7
- Coastals        Nos. 4, 10, 11 and 21

During the year a total of 2,086 flying hours was carried out. The best months being April with 215 hours, June with 226 hours, and July with 258 hours. The weather was generally unsuitable for flying both in the spring and late autumn.

The policy was adopted of sending out on patrol not more than two coastal airships at any one time. This succeeded in reducing the flying hours but allowed a more efficient patrol to be kept up. It also maintained engine running down which required less engine changes due to failures. The Vickers-built Parseval ships were mainly employed in training pilots and crews for rigid airship work.

A temporary mooring ground was established at Gosforth Park, near Newcastle and was used by the Coastal ships which could land there at night at the end of a patrol, and return to Howden the following day. The ships were moored out in the open, secured to a landing block or a Jeffrey lorry by the 'Usborne' method. A supply of gas and petrol was also stored there. This substation was closed on 1 October 1917 as the soldiers whose services were utilized for landing the airships, had left the district.

Rigid airship No.9 had arrived at Howden on 4 April and carried out a number of instructional flights for officers and crews. Her principal flights throughout the year were as follows:

- During June a patrol over the sea lasting 10 hours
- 26 June – a flight of 12  $\frac{3}{4}$  hours
- On 21 July there was a flight of 26  $\frac{3}{4}$  hours covering a distance of 430 miles – a record flight for a British airship in 1917
- On 6 August the ship carried out a long flight of 24  $\frac{3}{4}$  hours, landing at East Fortune owing to fog.

Parseval No.4 left for Pulham in March, and in May Parseval No.6 carried out trials, plus a further flight trial of six hours in the early part of June. Owing to lack of lift, this ship was principally employed in night flying. On one occasion in July the ship carried out a patrol of 16 hours, and also in the same month made two special night flights to test local anti-aircraft defences. On 6 August she left for Cranwell to be stationed there for training purposes.

In April, Coastal C11, while returning from patrol in thick fog, collided with the top of a 500 foot hill near Scarborough. The captain put the ship controls to hard up, but the after-skid struck the hill taking it with the after engine, engineer's seat, the engineer himself and all the valve controls. The ship then became 1,800 lbs lighter and ascended rapidly until the pressure rose to 85 mm. The top patch was pulled off and the ship descended rapidly from 3,000 feet and was completely smashed.

The redesignated Coastal C11a, having been repaired and re-inflated, carried out its initial trials on 19 July and left the station two days later to undergo further trials. After the ship had been in the air for 50 minutes, it became very heavy. Although the ballast was released and the engines were run flat-out with the elevators hard up, the ship struck the water, being over the river Humber at the time. The car was at once submerged and the envelope came down on the water. After a few seconds the whole ship burst into flames. Two officers, the 2<sup>nd</sup> Coxwain, and the engineer managed to get clear. The car, engines, valves and rigging were practically undamaged and were saved.

Whilst moored out at Gosforth, Coastal C19 broke its propeller, which then pierced the envelope in several places. The ship lost pressure very quickly, the tail rose up rapidly breaking off the after-skid and three struts. The ship was deflated to prevent further damage being done to the car.

On 14 October the rigid airship No.25 arrived from Barlow and carried out its acceptance trials on 23 December.

On 15 October the airship left for Cranwell, but returned to Howden on 29<sup>th</sup> and landed owing to bad weather. The ship was then seriously damaged while being taken into its shed and was out of commission for the remainder of the year.

On 19 October rigid airship No.23 landed en route for Pulham and left for that station ten days later.

On 12 November, Parseval No.5 carried out its trials. This ship was rigged to a new car of a modified Coastal pattern with two 240 hp Renault engines.

On 4 December airship SS 9A, which had been sent to the station for experimental purposes, was returning from patrol when the engine failed. The ship made a forced landing and was ripped, but only slight damage occurred.

On 22 December Parseval No.7 carried out a trial flight of six hours, the speed obtained being 41 mph.

### **6.3 1918**

Blowers were installed inside No.1 rigid shed to allow for the transfer of gas from one ballonnet to another, or from an airship to a gas holder. This scheme was necessary because the price to produce hydrogen had significantly increased. It was a simple case of adapting the existing 12 inch pipe work and installing a blower and motor.

In the first few months of 1918 saw the latest non-rigid SSZ class (Zeros) start to arrive at Howden with SSZ 32, SSZ 38 and SSZ 58 all becoming operational during March and April. It was in April that the mooring-out site at Lowthorpe became operational with SSZ 23 operating from there, having being sold to the US Navy. Other ships using this site included SSZ 32 which was wrecked close to Lowthorpe on 19 May. Another mooring-out station at Kirkleatham near Redcar became operation during May.

Several of the older coastal were replaced by the improved C Star class, with C Star 2 and C Star 4 arriving early in 1918, along with SSZs 54 and 55. On 10 May C star 4 escorted a south-bound convoy of forty ships.

On 28 May C Star 4 escorted a convoy of thirty ships, five drifters and two TBDs, and later escorted a convoy of thirty ships, six drifters and a pair of destroyers. On 25 May C Star 2 on a Grand Fleet Patrol sighted an enemy submarine NNE of square 24 ZD, seven miles distance but the submarine had disappeared before the airship could arrive at its position.

A rigid airship, the R27, was destroyed by fire in the Howden No.1 shed. On 16 August 1918, a non-rigid SSZ class airship, the SSZ 23, was packed ready for transport to America, complete

with a new envelope. The American crew decided to present the RNAS with a 'new' unnumbered airship and rigged the old envelope with a spare car. Inside the shed were R27, SSZ 38, SSZ 54, the packed SSZ 23, and the 'new' unnumbered SSZ. When the work was nearly completed, the W/T operator checked his W/T set and a spark from the set ignited petrol in the car. The resulting inferno destroyed all the airships except one nearest an open door. The brunt of the explosion was borne by the roof sheeting which opened up, killing a man who was on look-out duty in the observation tower. A large portion of the roof steelwork was subjected to the intense heat of the burning hydrogen gas but there was not any serious damage. Much of the internal air pressure was relieved because one of the main doors had been left open. However the explosion flaps failed to work and as a result all subsequent sheds were built without them.

On 6 November the new R31 made an unscheduled stop, it had been en-route from Cardington to East Fortune but had suffered a number of broken frames and girders (it was a wooden vessel similar to a Shult-Lanz). It was garaged in the damaged rigid shed for repair, but then came the cessation of hostilities and the will to repair it. The timber quickly deteriorated and eventually all salvage material like the five 275 hp Rolls Royce engines were removed and the R 31 was sold for scrap In July 1919.

#### **6.4 1919 – 1922**

In June 1919 the following deflated non-rigid airships were on charge at Howden:

- C 2 (one 110 hp Berliet and one 220 hp Renault)
- C5a (one 160 hp Sunbeam and one 220 hp Renault)
- C14a (one 110 hp Berliet56 and one 220 hp Renault)
- C Star 2 (one 110 hp Berliet and one 240 hp Fiat)
- C Star 9 (one 240 hp Fiat and one 110 hp Berliet)
- Parseval 6 (two 220 hp Renault)
- SSTs 3, 4, 7, 9, 11 & 12 (two 75 hp RR)
- SSZs 32, 55, 62, 63 & 64 (one 75 hp RR).

After the transfer of the responsibility for the construction, maintenance and operation of airships from the Admiralty to the Air Ministry, the RN Airship Store Depot at White City was destined for vacation in 1920, and it was proposed to transfer the unit to Howden.

The main operational post-war function was the need to clear the North Sea of mines. More modern SST-class airships were used for this purpose (see list above).

After R34's successful Transatlantic flight, it was overhauled at Howden, then took-off on 27 January 1920 for an exercise over the North Sea. In deteriorating weather, it struck the North Yorkshire Moors near Guisborough but managed to get back to Howden the following day. The ground staff at Howden failed to get it back into its shed owing to the rising wind, and had to be moored outside. The next day it was found to be badly damaged and the ship was broken up where it lay. The facts revealed at the Court of Enquiry showed that the R34 was not fit for flight, the wireless failed to work, and the charts the crew were using were out of date. Furthermore, the ship's captain (Flight Lieutenant HV Drew) had insufficient knowledge of navigation and apparently did not even get out of bed to verify the ship's position, but left this to one of his junior officers who was under his instruction.

Some of the blame was aimed at Howden and its senior flying officer Flight Lieutenant Archibald H Wann as the aerodrome was deemed to be inadequate for handling the task of housing R34 in anything but fine weather.

Apart from the proposed sale of R38 to America, the rigid programme more or less came to a standstill, but the potential sale of airships to the rest of the world would prove a life saver for the industry. The US Navy accordingly sent personnel to Howden to train for the task of flying the R38 over the Atlantic, and started to overhaul the wooden R32. Flights took place in August 1920 and continued into 1921, when they were forced to transfer to the R80 owing to the loss of R34. The R38 was a new ship, being constructed at Cardington, its third flight 17 / 18 July took it to Howden but damage was sustained to several girders and repairs had to be made, before its next flight which took place on 23 August. Tragically while carrying out high-speed manoeuvres over Hull, R38 broke up, falling into the River Humber in two sections, one on fire. There were just five survivors with the majority of US Navy personnel on board being killed. This was the nail in the coffin for the industry and Howden closed down, the last rigid flight being the R80 which took-off for Pulham on 20 September 1921.

An offer was made in July 1922 for the purchase of the airship station from an estate agent called Humbert and Flint Ltd but their offer was deemed too low.

## **6.5 1923 – 1933**

In 1924, the Government decided to build two airships of five-million cubic feet capacity (5MMCF). One of these, the R101, was 720 feet in length with a diameter of 120 feet. It was too large for the existing shed at Cardington (700 feet long by 180 feet wide and a clear height of 180 feet). The shed had therefore to be extended in length by 112 feet and in height by 35 feet. It was considered unnecessary to have doors at either end. It was also decided to erect a mooring mast or tower so that visiting airships could be berthed outdoors. In October a contract was awarded to the Cleveland Bridge & Engineering Co Ltd for the enlargement of the shed.

An original proposal (as discussed at a meeting between Air Ministry (AM) and the Airship Guarantee Company (AGC) on 5 August 1925) for the construction of two 5MMCF airships was that both should ships be erected at Howden inside the twin shed, one to a Royal Airship Works (RAW) design and the other to AGC design. Owing to the small clearance between the airships and the framework of the shed, Howden would not be suitable for operational purposes. This proposal would have left the Cardington shed vacant for operations and RAW staff would manufacture the gas bags for both vessels. This however never happened and when the contract was signed in 1924, the R100 had limiting dimensions of 133 feet in diameter with a length of 750 feet, but then a reduction was made to the final design, to 130 feet 9½ inches in diameter and 709 feet 3½ inches long. The over-all height when the airship was bagged down at its maximum diameter was 132 feet 7¾ inches which gave a distance of 4 feet between the bottom of the hull and the floor of the shed (September 1926 figures).

The first trials prior to first flight - a requirement of the provisional Certificate of Air Worthiness, had to be completed in the shed because there was no mast at Howden. There were two main trials:

- Power plant tests. This was chiefly to test the engines over some considerable duration, the checking of the electrical and fuel systems and to give the ship's crew preliminary training in their duties.
- Lift and trim trial. This involved allowing the vessel to float freely in the shed for a series of short periods, during which time certain measurements were undertaken.

Much correspondence between the Air Ministry and AGC took place between 1925 and 1927 concerning the clearance between the R100 and the framework of the shed with the AM saying that there was not enough and AGC arguing that it was not a problem.

The Air Ministry contract with the Airship Guarantee Company actually stipulated that the airship would be required to re-enter its shed during the trial period for modifications and repair, and the



AM had allowed a contribution figure of £50,000 to cover shed modifications and associated plant (Clause 6).

The AM felt it was one thing to build the R100 but it would be very difficult to get the airship back into its shed unless the weather was very calm and even then it would be extremely difficult. The clearance between the frames and the airship was deemed as being so small that even a minute light swing of the airship when being brought out of the shed would bring the fins or elevators into contact with the sides or roof of the shed. There were only four handling points on the R100, one auxiliary control car, two engine wing cars and an aft engine car. This gave a handling area for 80 men which would be just enough to be able to deal with a wind of 4mph.

With the fins inside the shed, both the forward and aft car handling parties had to keep within five feet of the shed centre line to avoid the ship fouling the shed. When the fins were clear of the shed, provided the forward car handling party kept to within eight feet and the aft car party within about ten feet of the centre line of the shed, then the ship would not foul the structure. These clearances remained the same until the ship was about half way out, when they improved until the ship was clear of the shed. The reverse would happen if the ship was being put into the building.

There was no other shed in the UK capable of handling it. The single structure at Cardington would, in the event of the R100 being completed first, be occupied by the R101; the R100 would be left attached to the mooring mast at Cardington. One option was to complete R101 first and then to fly it India to carry out its trials there so that R100 could then be housed inside the Cardington shed should the weather deteriorate.

The only solutions available to the Air Ministry, was to build a mooring mast at Howden, and / or to build another shed at Cardington. The first problem was a political one concerning an AM funded mast built onto a private company's land, plus the fact that the clay soil at Howden was not suitable for erecting a mast and would require considerable expense in constructing its foundations. The cost was estimated to be £10,000 for the foundations, £60,000 for the mast (which included the heavier Burney head) and £20,000 for a handling party and maintenance etc. (Excluding the handling party, the figure of £70,000 was quite different from the £50,000 estimate for the RAW mooring mast). Even if the mast was built, there was still the problem of nursing the R100 back into its shed. The best option therefore was to build another shed at Cardington.

By the first week of July 1927, construction of the R100's hull was almost complete and at this time it had become easier to gauge more accurately what the conditions would be for handling the vessel. The company had decided that the clearance was sufficient to safely handle the vessel both in and out of the shed, provided a mooring mast was available to allow calm weather conditions to be utilized for re-entry into the shed. In addition a trained Air Force handling party would be required, together with a proper meteorological service and a resident meteorological officer. It was proposed to take the airship out towards the north east end and necessary alterations to the shed would have to be carried out to accomplish this. Part of the problem was that the height of the doors did not equal the height of the shed. The company wanted to take the ship out tail first, as this gave a greater manoeuvring area available at that end.

The AGC also wanted to buy the airship at the completion of the trials and would then have to rehouse the ship in the Howden shed. Bringing the vessel in bow first would give a considerably greater clearance than if the vessel was brought in stern first.

In the end the mooring mast never got built and the decision was taken by the Air Ministry to build a second shed at RAW, Cardington to the tune of £145,000 to house the R100. For speed and economy it was decided to dismantle the existing No.2 shed at Pulham and on 30 June 1927, a contract was awarded to the Cleveland Bridge and Engineering Co Ltd for the dismantling, extending and re-erecting. The project was completed and handed over to the AM on 1 January 1919. This was justified on the grounds that it was anticipated that the AGC airship

would be ready for flight around April 1928 and R101 being ready about three months later. A full six months was required for the home trials which would be completed roughly by January 1929. This meant that the existing Cardington shed would not be available for R100 until after that date. The country was in a position to obtain a real lead in airship construction if the trials of the two airships were successfully carried out at the earliest possible date. It was also pointed out that the USA had given approval for the construction of an airship of 5.5 MCF, furthermore the French Government were also in the process of negotiating for the building of a large airship!

R100 made its maiden flight in the morning of 16 December 1929. After departing Howden it flew slowly to York then set course for the Government airship establishment at Cardington, cruising at around 50 mph on four engines, reaching the destination in around two hours flight time. Tragically R101 crashed at Beauvais, France in the early hours of 5 October 1930, with the loss of 43 lives. The British Government then suspended all airship activities, and three years later R100 was broken up for scrap inside its shed at Cardington.

No.2 shed was dismantled between 1933 and 1935.





Plate 31: (above) Water tower c.1918 and Plate 32: Water tower c.1981 NGR: SE 74698 32967



Plate 33: Steel tie ring – Howden



# Part 7: Howden Airship Station Site Visit Report

25-02-11

**Present:** Paul Francis, Noel Ryan & Chris Percy

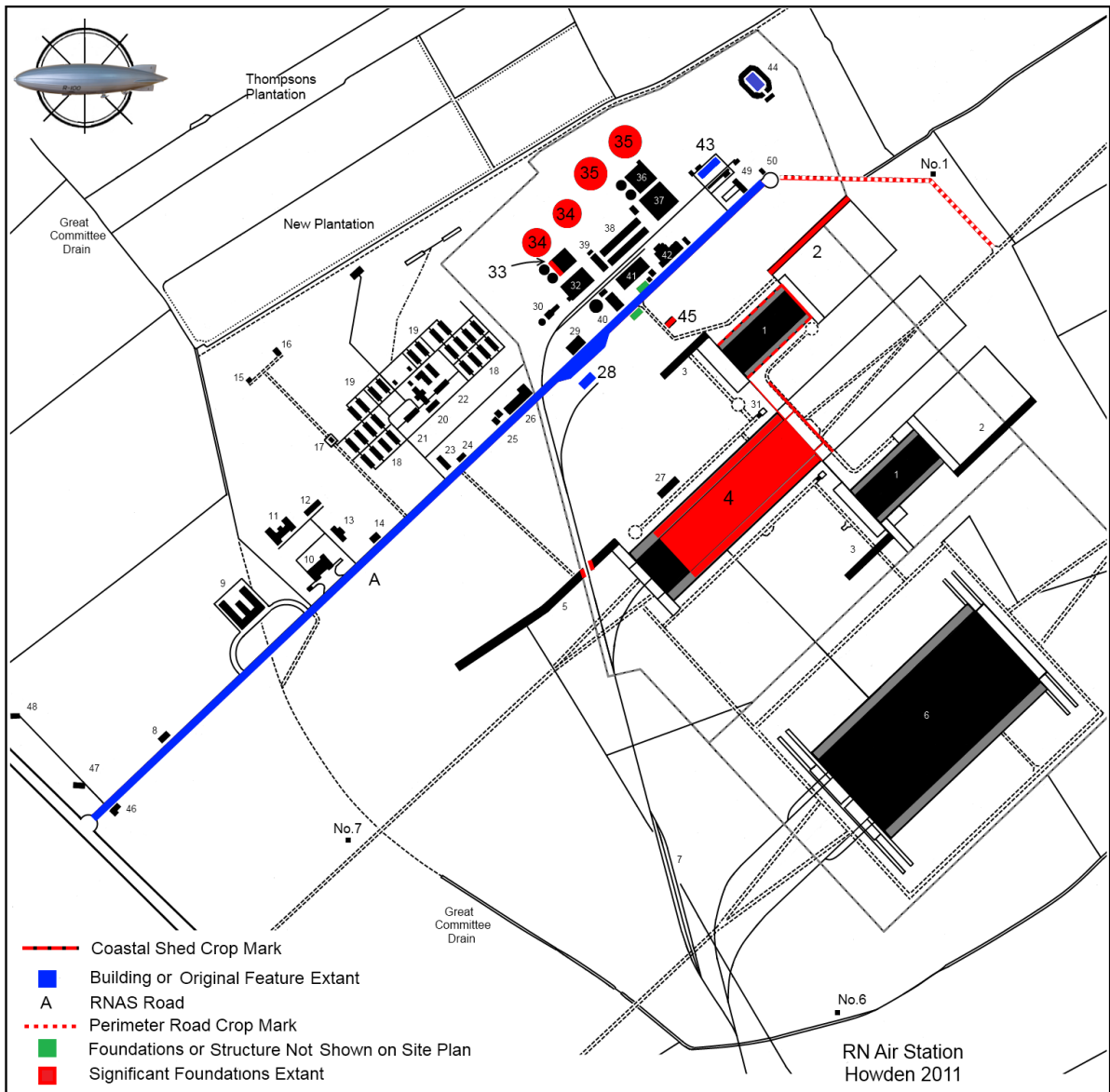
**Weather and Site Conditions:** Intermittent heavy rain, thick mud and very wet under foot.

Boothferry Golf Club was visited first where we met up with Kenneth Deacon of the Barnes Wallis Trust who showed us the Howden Air Station display boards and then took us to two in-situ blimp mooring tie down rings adjacent to the golf club on Spaldington Road. A complete one is located at (SE 75652 32060) and close by is a vandalised one. He then took us to an adjacent golf club where the owner had recovered a different type of mooring tie down ring and concrete block which is not on its original site.



(A) Mooring ring (with £1 coin for scale)

We then left Ken and made our way to the main site where we met the owner Rob Inglis. The following structures were found:



(B) Site Plan



**1. RNAS Road**

The main concrete site access is extant over its entire length.

**2. Petrol Installation (NGR: SE 74749 32911) – Bldg.28**

This is an earth mounded concrete structure with 9 inch concrete walls, arranged as four bays with an almost completely buried steel petrol tank, five 4 inch diameter steel petrol inlet points are present and a steel ladder that gives access to the structure's floor level which is below natural ground level. The bays are almost completely filled in with earth. A contemporary photo of this structure shows a brick built pump house on top of the mound plus several petrol stand posts adjacent to the RNAS Road and electric lamp standards (all of these structures are missing). The photo also shows an adjacent railway and tanker apron. It is presumed that a railway petrol wagon offloaded its contents into the buried tank using the four petrol inlet points. Petrol required for servicing airship engines was taken by an RNAS tanker lorry which had been filled up from the stand posts.



(C) Petrol inlet pipe



**3. Concrete Foundation Blocks (SE 74983 33060 typical) Bldg. 33 (presumed)**

In the field on the NE side of the RNAS Road is a series of concrete 'L' and rectangular- shaped foundation blocks which were once part of the Water Gas Hydrogen Plant.



(D) Foundation blocks

**4. Vehicle Ramp (NGR: SE 74810 33010)**

The concrete vehicle ramp is not shown on the RNAS Howden site plan. Access was 'difficult'.



(E) Concrete ramp surrounded by mud.



**5. Coal Bunker (presumed) (NGR: SE 74796 32967)**

On the southern side of the RNAS Road is what appears to be a Coal Bunker Compound. It consists of a 5 bay open enclosure, constructed of 2 ft thick concrete walls, 6 ft 3 in high. Each bay has a nominal dimension of 13 ft by 10 ft. It is not shown on the RNAS plan.



(F) Coal bunker?

**6. Concrete Foundation Blocks (NGR: SE 74718 33003)**

To the south of the RNAS Road is a pair of concrete foundation blocks with studs. They are both in two parts, one 11 ft 6in long and the other 6 ft. They may have been a part of the temporary silicol plant.



(G) The parallel foundation blocks



## 7. Windbreak Foundation Blocks

On the NE end of No.1 Rigid Airship Shed is a set of five and another of two triangular-shaped foundation blocks with four studs / nuts that supported the shed's windbreak that connected the rigid shed to the NE coastal shed. They are positioned at 24 ft 2 in centres.



(H) One of several similar blocks

## 8. No.1 Rigid Airship Shed Door Foundations (NGR: SE 74930 32898) Bldg.4

There are a number of concrete features extant that were once part of the NE door arrangement. These include a door buffer constructed of 9 inch concrete with a drainage gully or door runner, a full width drainage gully and various structures associated with the doors of unknown function.



(I) Shed door Buffer (presumed) from the rear.



## 9. No.1 Rigid Airship Shed Main foundations Bldg.4

On Google Earth there appears to be a rectangular-shaped wooded area of similar shape and alignment as the No.1 rigid Airship Shed. On closer inspection on the ground, the NE boundary is littered with abandoned concrete blocks. Between the door foundations and the wood is a series of 9 ft square concrete blocks arranged as pairs, each having steel studs. These are the foundations of the shed main 'A' frames, the area between a typical pair of blocks being the annexe. Both sets of blocks are located along both sides of the shed and continue through the wood. About ¾ of the sheds 700 ft worth of concrete foundations are extant.



(J) A row of shed foundation blocks with studs



#### 10. Hydrogen Pits Bldg.4

Almost immediately on entering the wood at the NE end is a full span hydrogen pipe pit (3 ft wide) and a similar but longitudinal pit running full length along the centre line of the shed within the wood (presumed).



(K) Hydrogen pipe pit junction

#### 11. No.1 Rigid Air Ship Shed Windbreak (2)

On the SW side of the site of No.1 Rigid Airship Shed a small section of windbreak foundation blocks located at the point where it meet a water course and the railway.



(L) SW windbreak, No.1 Rigid Airship Shed



## 12 NE Coastal Shed Bldg.1

The only remains of the NE Coastal Shed are a crop mark and two concrete foundation blocks.



(M) Coastal shed foundation block

## 13. NE Coastal Shed Windbreak Bldg.2

The NE windbreak foundation blocks are extant but most are under water Except where they bridge a water course), no sign of the SW windbreak was found.



(N) Coastal Shed windbreak foundation blocks



**14. Department of Works Offices (NGR: SE 74868 33130) (Bldg.43)**

This building has a span of 20 ft 2 in, is constructed of 9 inch brick walls with timber casements. The roof is a series of timber king post trusses covered with corrugated asbestos sheeting. The building is 48 ft 8 in long (internal). There are three rooms plus a small store which is accessed from the outside.



(O) Department of Works Offices

**15. Magazine (NGR SE 74908 33220) Bldg.44**

The magazine has mainly lost its roof which was timber framed with hipped shaped rafters supported on a steel gantry, roof covering was diamond-shaped asbestos tiles. Walls are permanent brick with steel casements. Outside a concrete curb is located around all four walls which stopped a full height earth mound from slipping. The earth mound being for blast protection but is now largely been eroded. The floor is under water so access was difficult.



(P) Magazine



## **16. Perimeter Road**

Part of the perimeter road, built c.1918 to give vehicle access to ten blimp mooring points survives as a crop mark.



(Q) Perimeter road

## **17. Wells (location unknown)**

Two wells or bore holes were not found but are known to be extant.

## **18 Hydrogen Tanks (Bldgs.34 & 35)**

All four of the main hydrogen tank concrete bases are extant although three were completely covered by water and the fourth by a covering of grass.

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